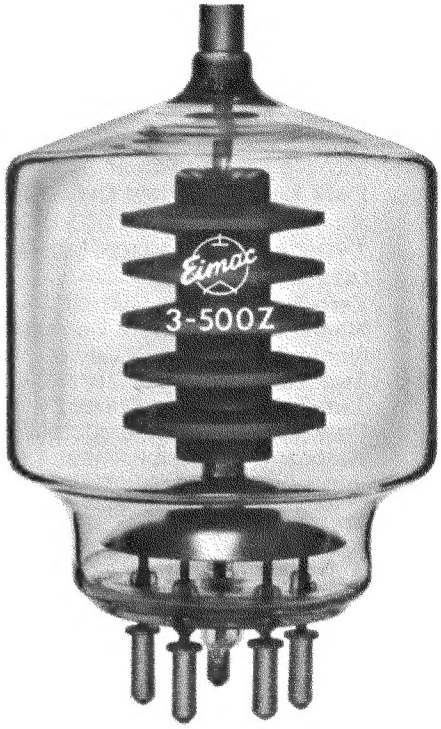
EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

3-500Z

HIGH-MU POWER TRIODE

The EIMAC 3-500Z is a compact power triode intended to be used as a zero-bias Class-B amplifier in audio or radio-frequency applications. Operation with zero grid bias simplifies associated circuitry by eliminating the bias supply. In addition, grounded-grid operation is attractive since a power gain as high as twenty times can be obtained with the 3-500Z in a cathode-driven circuit.



GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten		
Voltage	5.0	V
Current	14.5	A
Amplification Factor (Average)	160	
Interelectrode Capacitances (Average):*		
Grid-Filament	7.4	pF
Grid-Plate	4.1	pF
Plate-Filament	0.07	pF
Frequency for Maximum Ratings	110	MHz

MECHANICAL

Base	5 Pin Special
Basing	See Drawing
Mounting Position	Vertical, base down or up
Cooling	Radiation and Forced Air
Heat-Dissipating Plate Connector	HR-6
Recommended Socket	EIMAC SK-410
Recommended Chimney	EIMAC SK-406
Maximum Operating Temperatures:	
Plate Seal	225°C
Base Seals	200°C
Maximum Over-all Dimensions:	
Height	5.875 in
Diameter	3.438 in
Net Weight	7 oz

*In Shielded Fixture

(Effective 3-15-68) © 1968 by Varian

Printed in U.S.A.

R-F LINEAR AMPLIFIER GROUNDED-GRID, CLASS-B

MAXIMUM RATINGS

DC PLATE VOLTAGE	4000	VOLTS
DC PLATE CURRENT	0.400	AMP
PLATE DISSIPATION	500	WATTS
GRID DISSIPATION	20	WATTS

TYPICAL OPERATION (Single-Tone Conditions)

DC Plate Voltage	3000	V
Zero-Sig DC Plate Current*	160	mA
Max-Sig DC Plate Current	370	mA
Max-Sig DC Grid Current	115	mA
Driving Impedance	115	ohms
Resonant Load Impedance	5000	ohms
Max-Sig Driving Power	30	W
Peak Envelope Plate Output Power	750	W

TYPICAL OPERATION (Minimum Distortion Products)*

DC Plate Voltage	2000	V
Zero-Sig DC Plate Current*	95	mA
Single-Tone DC Plate Current	400	mA
Single-Tone DC Grid Current	130	mA
Two-Tone DC Plate Current	270	mA
Two-Tone DC Grid Current	80	mA
Peak Envelope Useful Output Power	500	W
Resonant Load Impedance	2750	ohms
Intermodulation Distortion Products	-38	dB

TYPICAL OPERATION (Minimum Distortion Products at 1 KW PEP Input)**

DC Plate Voltage	2500	V
Zero-Sig DC Plate Current*	130	mA
Single-Tone DC Plate Current	400	mA
Single-Tone DC Grid Current	120	mA
Two-Tone DC Plate Current	280	mA
Two-Tone DC Grid Current	70	mA
Peak Envelope Useful Output Power	600	W
Resonant Load Impedance	3450	ohms
Intermodulation Distortion Products	-33	dB

TYPICAL OPERATION (Minimum Distortion Products at 1500 volts Plate Voltage)**

DC Plate Voltage	1500	V
Zero-Sig DC Plate Current*	65	mA
Single-Tone DC Plate Current	400	mA
Single-Tone DC Grid Current	130	mA
Two-Tone DC Plate Current	260	mA
Two-Tone DC Grid Current	80	mA
Peak Envelope Useful Output Power	330	W
Resonant Load Impedance	1600	ohms
Intermodulation Distortion Products	-46	dB

A-F AMPLIFIER OR MODULATOR, CLASS-B

MAXIMUM RATINGS (PER TUBE)

DC PLATE VOLTAGE	4000	VOLTS
DC PLATE CURRENT	0.400	AMP
PLATE DISSIPATION	500	WATTS
GRID DISSIPATION	20	WATTS

TYPICAL OPERATION (Sinusoidal Wave, Two Tubes, Grid Driven)

DC Plate Voltage	3000	V
DC Grid Voltage	0	V
Zero-Sig DC Plate Current*	300	mA
Max-Sig DC Plate Current	770	mA
Max-Sig DC Grid Current	244	mA
Driving Power	25	W
Peak A-F Driving Voltage (per tube)	100	V
Load Resistance, Plate-to-Plate	8600	ohms
Max-Sig Plate Output Power	1420	W

R-F POWER AMPLIFIER OR OSCILLATOR, CLASS-C

MAXIMUM RATINGS

DC PLATE VOLTAGE	4000	VOLTS
DC PLATE CURRENT	0.350	AMP
PLATE DISSIPATION	500	WATTS
GRID DISSIPATION	20	WATTS

TYPICAL OPERATION

DC Plate Voltage	3500	V
DC Plate Current	300	mA
DC Grid Voltage	-75	V
DC Grid Current	115	mA
Peak R-F Grid Voltage	187	V
Grid Driving Power	22	W
Plate Output Power	850	W

R-F POWER AMPLIFIER PLATE-MODULATED

MAXIMUM RATINGS

DC PLATE VOLTAGE	3000	VOLTS
DC PLATE CURRENT	0.275	AMP
PLATE DISSIPATION	320	WATTS
GRID DISSIPATION	20	WATTS

TYPICAL OPERATION (Carrier Condition)

DC Plate Voltage	3000	V
DC Plate Current	275	mA
DC Grid Voltage	-100	V
DC Grid Current	120	mA
Peak R-F Grid Voltage	200	V
Grid Driving Power	25	W
Plate Output Power	640	W

NOTE: In most cases, "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. No allowance for circuit losses, either input or output, has been made. Exceptions are distinguished by a listing of "Useful" output power as opposed to "Plate" output power. Values appearing in these groups have been obtained from existing equipment(s) and the output power is that measured at the load.

*Approximate Value
**Measured data from a single tube.

APPLICATION

Mounting: The 3-500Z must be operated vertically, base up or down. A flexible connecting strap should be provided between the heat dissipating plate connector and the external plate circuit. The tube must be protected from severe vibration and shock.

Socket: The EIMAC SK-410 air system socket and SK-406 chimney are recommended for use with the 3-500Z. When a socket other than the SK-410 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate lead.

Cooling: Forced-air cooling is required to maintain the base seals at a temperature below 200°C, and the plate seal at a temperature below 225°C. Air-flow requirements to maintain the above maximum temperatures are tabulated below. (For operation below 30 MHz.)

Base-to-Anode Air Flow		
Anode Dissipation (Watts)	Air Flow (CFM)	Pressure Drop (inches-WC)
300	6.6	.023
400	10.3	.052
500	13.0	.082

In all cases, air flow rates in excess of the minimum requirements will prolong tube life. NOTE: Two 3-500Z tubes in a single amplifier, chassis mounted, may be adequately cooled by use of a fan so mounted as to pressurize the space below the sockets. Fans suitable for use at or near sea level are Pamotor Model 2000, or Model 6500.

Class-C Operation: Although specifically designed for class-B service, the 3-500Z may be operated as a class-C power amplifier or oscillator or as a plate-modulated radio-frequency power amplifier. The zero-bias characteristic of the 3-500Z can be used to advantage in class-C amplifiers operating at plate voltages of 3000 volts or below by employing only grid-leak bias. If driving power fails, plate dissipation is then kept to a low value because the tube will be operating at the normal static zero-bias conditions.

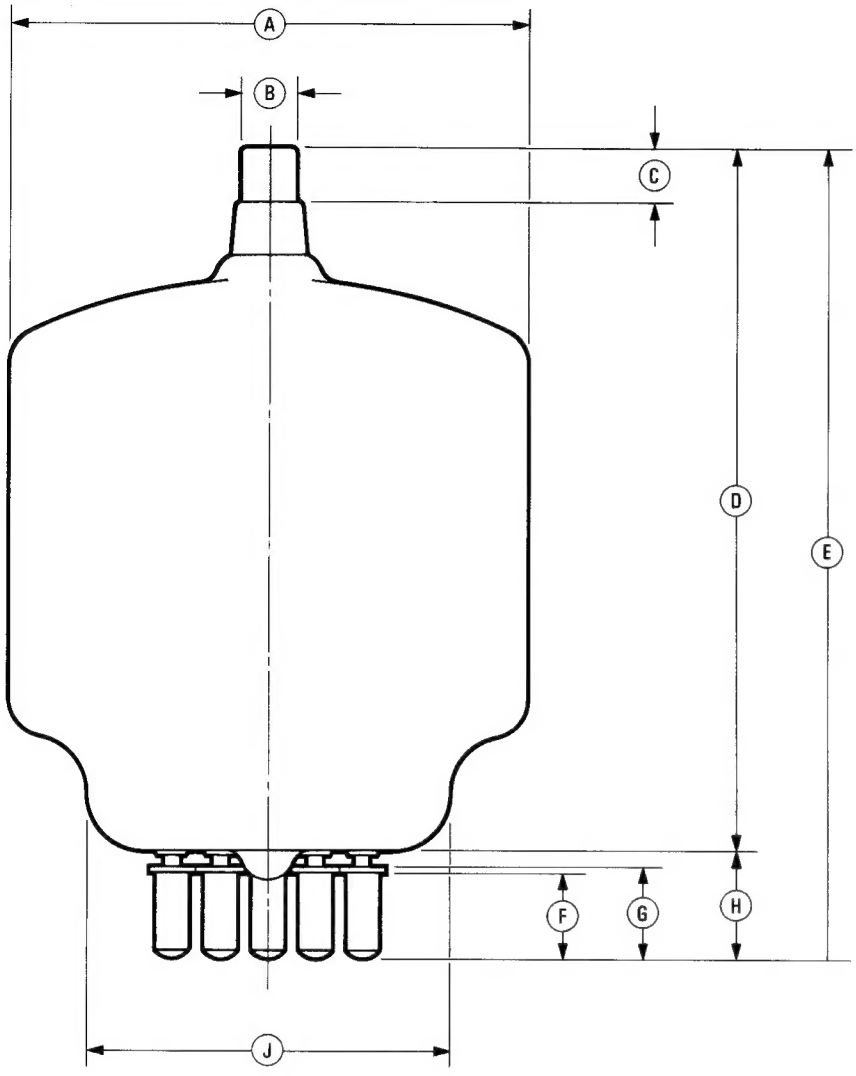
Filament Operation: The rated filament voltage for the 3-500Z is 5.0 volts. Filament voltage, as measured at the socket, must be maintained within the range of 4.75 to 5.25 volts to obtain maximum tube life.

Intermodulation Distortion: Typical operating conditions with distortion values included are the result of data taken during actual operation at 2 megahertz. Intermodulation values listed are those measured at the full peak envelope power noted.

Input Circuit: When the 3-500Z is operated as a grounded-grid r-f amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain greatest linearity and power output. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a "Q" of five or more.

Special Applications: If it is desired to operate this tube under conditions widely different from those given here, write to Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California, for information and recommendations.

3-500Z OUTLINE DRAWING AND PIN CONNECTIONS

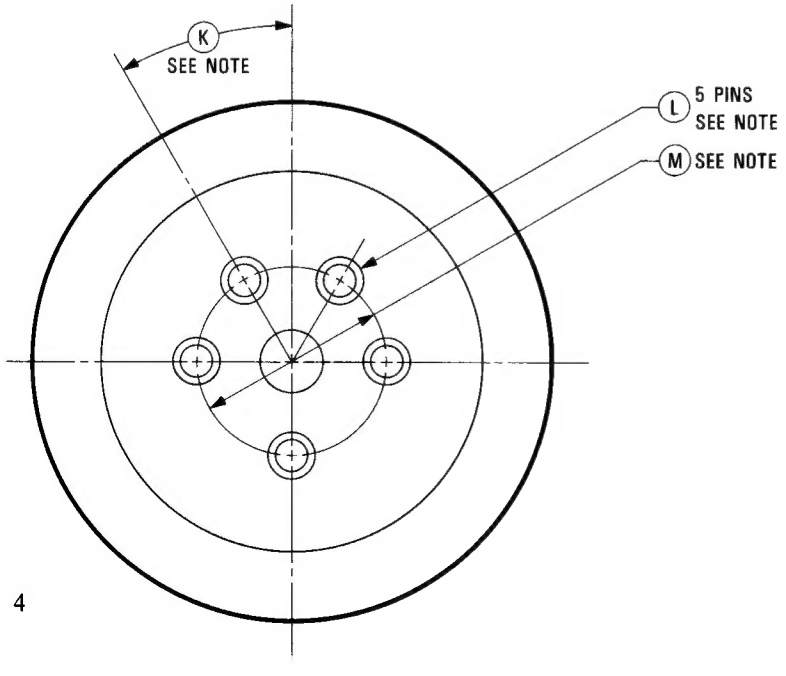


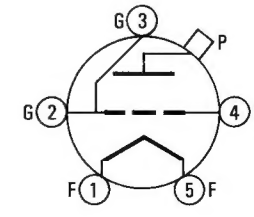
DIMENSIONS IN INCHES

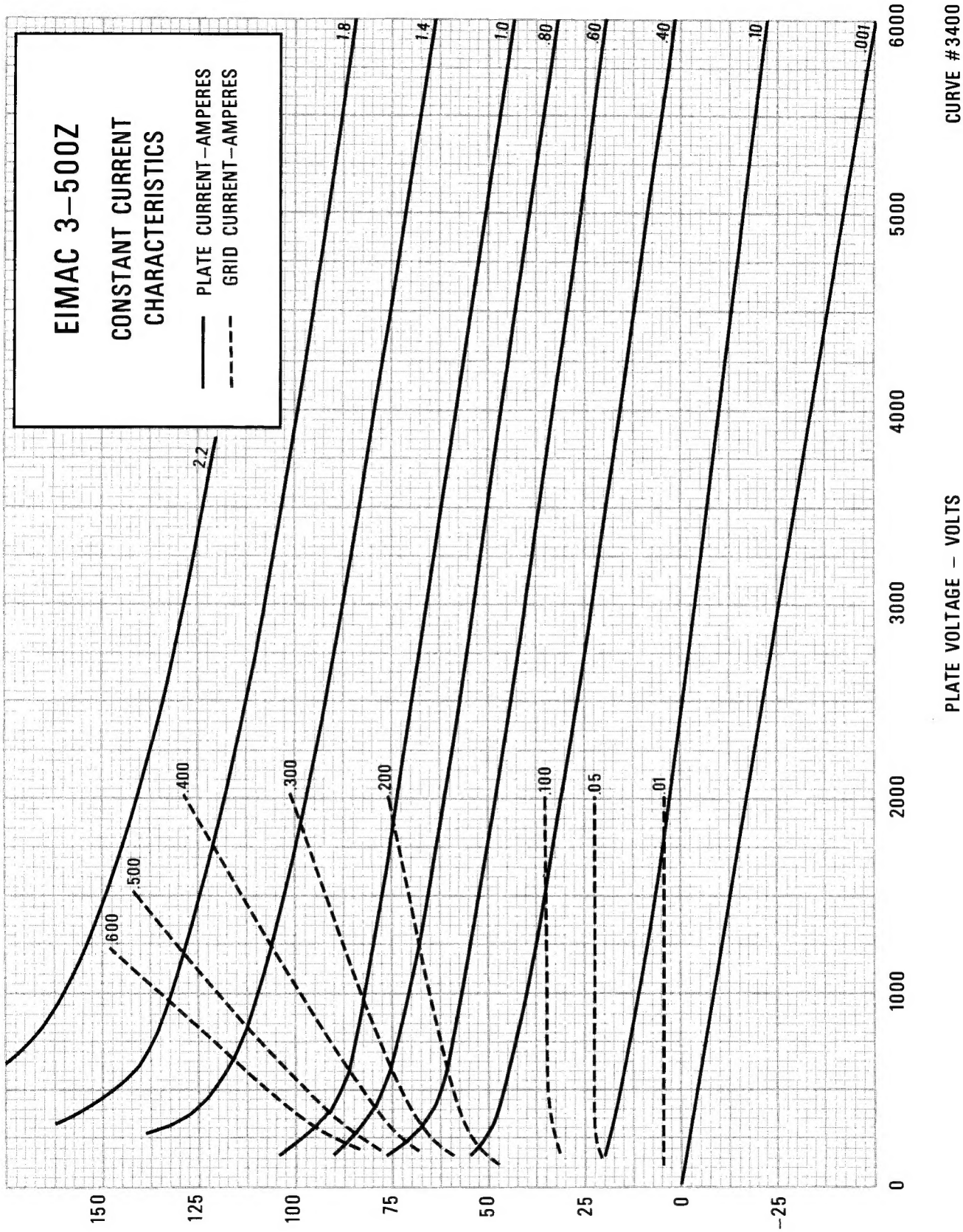
DIMENSIONAL DATA			
REF.	MIN.	MAX.	NOM.
A		3 7/16 D	
B			.355 D
C			.355
D			4 27/32
E	5 3/8	5 7/8	
F	1/2	5/8	
G	9/16	11/16	
H			25/32
J		2-1/2 D	
K			30° TYP.
L	.185 D	.191 D	
M			11/4 D.P.C.

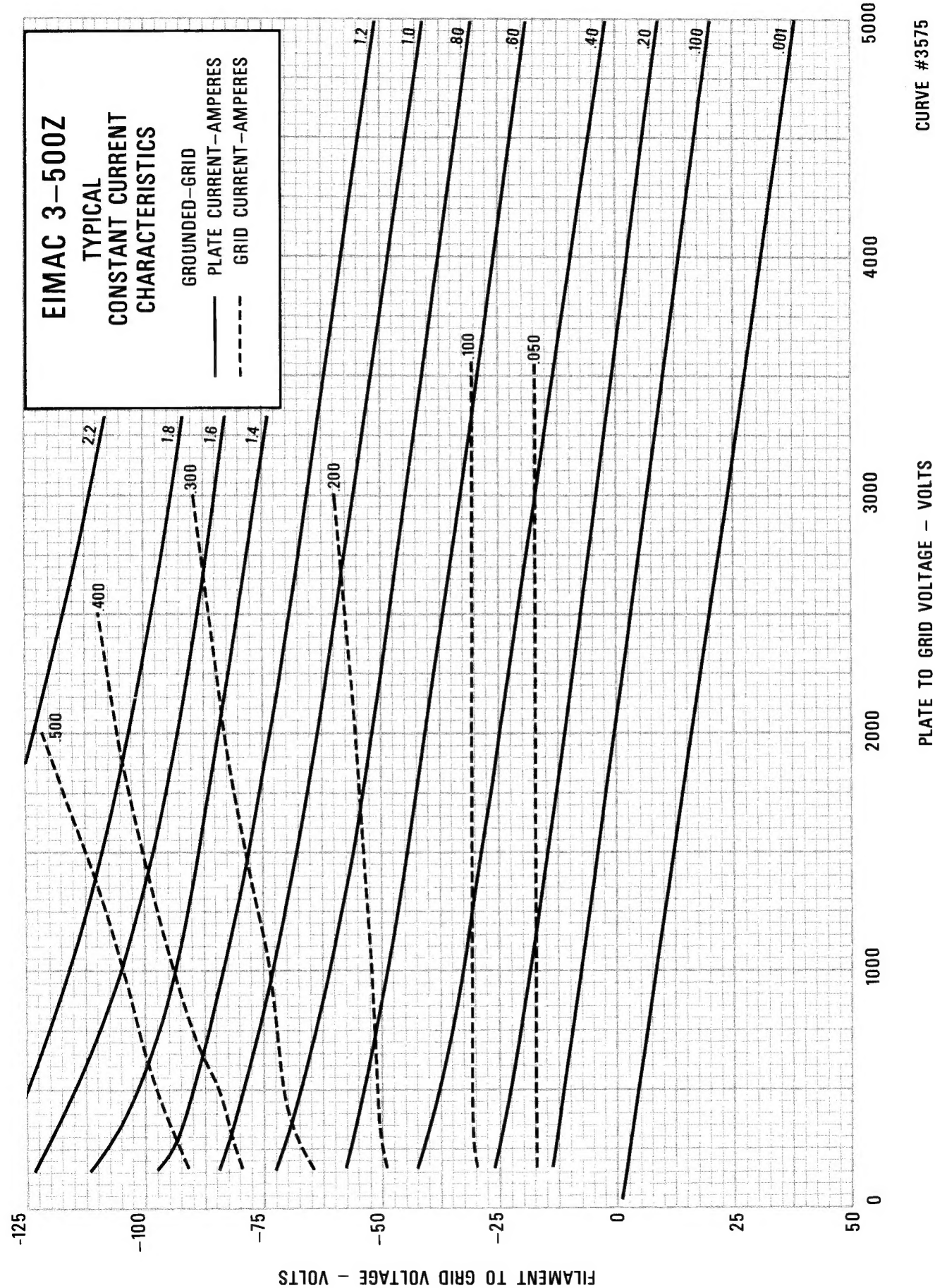
NOTE:

BASE PINS (L) ARE SO ALIGNED THAT THEY CAN BE FREELY INSERTED INTO A GAUGE ¼" THICK WITH HOLE DIA'S OF .204 LOCATED ON TRUE CENTERS BY THE GIVEN DIMENSIONS (K) & (M).






EIMAC 3–500Z
CONSTANT CURRENT CHARACTERISTICS
PLATE CURRENT–AMPERES
GRID CURRENT–AMPERES
2.2
1.8
1.4
1.0
.80
.60
.40
.10
.001
.600
.500
.400
.300
.200
.100
.05
.01
150
125
100
75
50
25
0
–25
0
1000
2000
3000
4000
5000
6000
GRID VOLTAGE – VOLTS
PLATE VOLTAGE – VOLTS
CURVE #3400


EIMAC 3–500Z
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GROUNDED–GRID
PLATE CURRENT–AMPERES
GRID CURRENT–AMPERES
2.2
1.8
1.6
1.4
1.2
1.0
.80
.60
.40
.20
.100
.001
500
400
300
200
100
050
-125
-100
-75
-50
-25
0
25
50
0
1000
2000
3000
4000
5000
FILAMENT TO GRID VOLTAGE – VOLTS
PLATE TO GRID VOLTAGE – VOLTS
CURVE #3575